

Community Response to the Design Features of Roads: A Technique for Measurement

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This paper describes a technique that was developed to determine user attitudes toward various roadside objects located along urban arterials. A photographic retouching technique was used on slides of the roadside to simulate experimentally the removal of selected portions of the roadside such as billboards, on-premise and off-premise signs, utility poles, and overhead wires. Eighty observers were asked to rate the aesthetic quality of the roadside by a set of semantic differential adjectives. In addition, eye movement recordings were obtained to determine how patterns of attention shifted depending on the removal of various roadside elements. Finally, observers were asked their opinions on a variety of urban problems to place the issue of roadside aesthetics in some context.

Analyses of the data suggest that the present technique holds promise to those who wish to investigate the visual impact of various portions of the environment with a greater degree of experimental control over the design elements involved. The implications of the present research for the development of a visual simulation device for pretesting user response to proposed changes in the roadside are discussed as well as the implications of the present research for traffic safety.

•THOSE WHO PLAN AND DESIGN environmental systems have become increasingly interested in research designed to ascertain people's environmental needs and preferences. On the surface, at least, the basic assumption guiding such research is relatively uncomplicated. Because many large-scale systems, such as transportation networks, must be designed for an anonymous and probably heterogeneous population, the successful realization of any design proposal rests partially on information that will lead to the development of consumer-based planning standards. In principle, the goal of such research is to make data available to the planner and decision-maker so that the portion of the system to be occupied by the target population is more clearly specified. In practice, however, the provision of such information is often beset with a number of difficulties. These can be related to the relationships that exist between the decision-maker and the researcher, the role of the researcher and decision-maker relative to the population they are serving, and the quality of the data provided by the researcher. As might be expected, each of these factors is interrelated with one another. For purposes of the present discussion, the mutual operation of these factors will be considered from the researcher's standpoint.

Most commonly, the researcher views himself as a technician who assesses the extent to which various environmental programs meet the goals elaborated by the decision-makers. The researcher believes that he should operate within a value-free setting that

is independent of the decision-maker's problems. Thus, he generally does not question the moral or ideological considerations that may have led to the decision to pursue one set of community goals at the expense of another. His major responsibility is to generate data that answer the questions of those who have made the decisions. For his part, the decision-maker is free to make use of the research findings or to ignore them depending on their relationship to other factors that must be incorporated in the decision framework. Although this model of the role relationships that exist between decision-maker and researcher is obviously simplified, it is a reasonable summary of the position of most researchers. How well, however, does this position fit with empirical reality?

If the researcher's role thus sketched is accepted as legitimate, then his value rests on the adequacy of the data that he provides to the decision-maker. The adequacy of the data, however, is not simply a technical problem stemming from the choice of methodologies that the researcher decides to employ. Arnstein (1) points out that the researcher is often not perceived as a value-free technician who is simply gathering information in as objective a manner as possible. In a number of instances, the researcher is considered an agent of the governing elite whose role is to forestall social action in favor of nebulous research goals. Although this attitude is most characteristic of the residents of urban ghettos, it is rapidly gaining some adherents among more educated segments of society. Resistance to research is increasingly encountered. This resistance is expressed behaviorally either as a refusal to participate or as an effort to forestall the initiation of a research program. The variety of forces that have created these attitudes toward research cannot possibly be considered here, but many of them may result from a belief that research information is simply ignored by decision-makers. Neither can consideration be given to the many factors that influence the decision to make use of research information, but obviously the quality of the information is an important factor.

One of the reasons that research findings are not employed more extensively is that decision-makers are often provided answers without a very good knowledge of what the questions are. Rein (2) suggests that "bewildered planners are left with a maze of tables and data that yield no immediately coherent themes and provide little information from which implications can be drawn." This problem is particularly characteristic of environmental research and is significantly related to the methodologies employed.

Most consumer preference research related to transportation planning is based on data drawn from interviews, questionnaires, and attitude surveys. If one wishes to know what people think about a certain environment, one simply asks them. Although this approach seems relatively straightforward, a number of crucial requirements must be met. Two of the most salient of these are that the respondent possess enough knowledge to answer meaningfully and that he be aware of both the choices and constraints operating in the system.

Rationality is most often violated when the respondent is asked to project preferences for and uses of future environmental developments. Extensive empirical justification is not required for one to assert that although individuals may have spent an equivalent amount of time in any particular environment they will perceive it in the same way. People differ in the degree to which they can handle the complexity that characterizes most existing physical systems, and the majority have extreme difficulty in projecting the implications of future changes in the environment. If, for example, individuals were asked to indicate how they would change the roadside along urban arterials so that it would be more pleasant and enjoyable, they would make a number of responses: remove overhead wires and utility poles; reduce, eliminate, or control off-premise and on-premise signs; increase landscaping; increase building setbacks; have more parking lots to eliminate on-street parking; and so on. Although these responses can be ranked there is absolutely no guarantee that actions taken to implement these suggestions would have the desired outcomes because no account has been taken of the context within which environmental change is to take place.

Perceptually, the roadside represents an extremely complicated balance of elements, but not all elements possess equal weight in contributing to the perceptual totality of any particular visual scene. The impact of various elements will obviously shift depending

on their relationships to the remaining elements. Thus, it would be entirely appropriate to inquire about the conditions under which landscaping would contribute most to driving pleasure, the types of landscaping that would be most desirable, the situations in which on-premise and off-premise signs should be reduced or eliminated, how building spacing should occur, and so on. Because the context will shift, it is almost impossible to assume that the generality required in most questionnaires and interviews will adequately reflect the complexities of the majority of environmental settings. The assumption concerning rationality on the part of the respondent then becomes more specifically an assumption concerning the respondent's ability to recreate environmental complexity in his imagination. This is a particularly difficult task.

To compensate for difficulties people have in imagining a complex environment that is undergoing change, planners often employ visual aids that capture some of the complexity. Although an extensive body of research does not exist concerning the best techniques for the presentation of visual environmental information to subjects, Fronczyk (3) has shown that many devices, such as maps and 2-dimensional displays (plans, elevations, and sections), employed by planners may not be extremely effective. The principle behind such devices is sound, however. Only 2 conditions must be met. The first is that the environment must be presented so that the observer clearly knows what the environmental alternatives are; the second is that technique should allow changes in the components that comprise the environment. The latter requirement is essential if the researcher wishes to assess systematically the relative contribution of various design elements to total observer perception.

The focus of the present study was to develop a technique for the presentation of environmental information to observers in such a way that specific components of the environment could be altered while leaving the remainder of the environment intact. The environments selected for study were 2 segments of an urban arterial highway leading into Seattle, Washington. Because it was impossible to experimentally change the actual roadside, slides were employed in which elements were deleted by photographic re-touching. This procedure gives a considerable degree of control over specific elements in the environment.

The observer behavior of interest in this study was response relating to aesthetics and the design quality of the roadside. This aspect of consumer preference was measured by a scale of aesthetic preference based on common descriptions given to the roadside. We anticipated that people would differ in their reactions to the roadside, and one of the research objectives was to see whether attitudes toward the city, design, visual complexity, and man's role in the natural environment might serve as a predictor of aesthetic response. A special questionnaire was constructed to assess these attitudes. The third scale included in the study attempted to locate the problem of roadside aesthetics within a context of general urban problems. A set of 13 urban problems was presented to the observers, and they were asked to assign priorities for solution. The final aspect of the experimental procedure involved the use of an eye-movement camera to determine what it was the observers were looking at. The objective here was to identify the various elements of the roadside that were fixated and to determine how patterns of eye movement shifted as a function of the removal of roadside objects.

TESTING PROCEDURES

Location and Description of the Routes

Two different segments of the roadside along Aurora Avenue in Seattle, Washington, were selected as the routes to be used as stimulus materials for this study. One segment was characterized as the commercial route and the other as the landscaped route.

The commercial route is a typical commercial strip of medium density. The route is surrounded by a variety of elements, such as utility poles and overhead wires, billboards, proprietary and institutional signs, buildings, trees, and plantings, that are characteristic of this type of development and the urban roadside generally. The landscaped route had the same elements as the commercial route but also passed through a mixed land use area with sparsely developed commercial characteristics and a significant amount of trees and planting.

These 2 routes were selected because they exhibited variable backgrounds and a common overlay of the kinds of physical objects typically placed along urban roadsides. One of the primary goals of the present study was to detect changes in observer evaluation that might occur as the existing environment is modified through the elimination of objects in that environment. We had to determine differences in evaluation that might occur when similar objects were removed from environments that possessed dissimilar background characteristics.

Slides of the Routes

Ten black and white photographs were taken of each route at intervals of approximately 300 ft. The camera was placed so that the field of view would approximate that of the passenger of an automobile. A photographic retouching technique was then used to eliminate objects from the roadside environment. In addition to the 10 slides of the route as it is, 10 slides each were made of 4 different transformations of the routes as follows:

<u>Transformation</u>	<u>Objects Removed</u>
1	Billboards
2	Utility poles and overhead wires
3	Utility poles, overhead wires, and billboards
4	On-premises signs, billboards, utility poles, and overhead wires

Each observer was shown the complete set of 50 slides for each route. Figure 1 shows a section of the commercial route as it is. Figures 2, 3, 4, and 5 show the same section after the 4 transformations.

The Observers

Tables 1, 2, and 3 give information on the 80 observers used in the study. They were divided evenly between male and female and student and nonstudent.



Figure 1. Commercial route as it is.



Figure 2. Commercial route after transformation 1, removal of billboards.



Figure 3. Commercial route after transformation 2, removal of utility poles and overhead wires.

TABLE 1
AGE OF OBSERVERS

Students		Nonstudents	
Age	Number	Age	Number
18	7	20 to 24	8
19	9	25 to 29	4
20	10	30 to 34	8
21	6	35 to 39	7
22	4	40 to 44	6
23	2	45 to 49	4
24	1	50 to 54	1
25	0	55 to 59	2
26	1	Total	40
Total	40		

TABLE 2
FAMILY INCOME OF OBSERVERS

Income, \$		Students	Nonstudents
Under	3,000	0	1
	3,000 to 5,000	1	4
	5,000 to 7,500	9	11
	7,500 to 10,000	11	12
	10,000 to 20,000	13	10
Over	20,000	6	2
Total		40	40



Figure 4. Commercial route after transformation 3, removal of utility poles, overhead wires, and billboards.



Figure 5. Commercial route after transformation 4, removal of on-premises signs, billboards, utility poles, and overhead wires.

TABLE 3
YEARS OF EDUCATION OF OBSERVERS

Years in School	Students	Non-students	Years in School	Students	Non-students
8	0	1	15	8	6
9	0	0	16	1	2
10	0	1	17	1	1
11	0	1	18	0	2
12	6	9	19	0	0
13	11	7	20	1	2
14	12	8	Total	40	40

The Semantic Differential

The semantic differential scale is a device that measures the meaning of an object (in this case the roadside) to an individual (4). In this study, the observer was asked to rate a given concept on a series of 7-point, bipolar rating scales. The center point of the scale indicates an indifferent response, and directionality from the center point indicates the emphasis and direction of the meaning intended by the respondent. Any concept can be rated by this technique.

The observers in the study were asked to rate or describe a series of slides of the urban roadside by adjective pairs such as simple-complex, usual-unusual, desirable-undesirable, safe-dangerous, useless-useful, organized-disorganized, and so on. The adjectives were selected from Strauss (5), Blake (6), and articles in *Progressive Architecture*, *Architectural Record*, and other critical and topical literature.

The Attitude Questionnaire

The attitude questionnaire was designed to measure a number of variables including artistic background and preferences; perceptions of the roadside and man's involvement in it; beliefs concerning the designer's role in dealing with the environment; attitudes relating to the importance of complexity, organization, simplicity, and chaos in the designed environment; and items reflecting the use of the scanning-focusing control mechanism. The scanning-focusing items related to characteristic modes of perceiving information external to the observer. They give information about whether the observer tends to search out environmental detail or whether he is relatively oblivious to surrounding or background information.

The Eye-Movement Camera

A stand-mounted Polymetric Model V-1164 camera was used to record eye movements. The camera makes use of a corneal reflection technique in which a spot of light is reflected from the observer's cornea and superimposed on a 16-mm moving picture of the scene being viewed. Under optimum conditions, the stand-mounted, eye-movement camera can achieve an accuracy of plus or minus 2 deg (a range of 1 to 4 degrees). To achieve this accuracy the instrument must be properly calibrated at approximate intervals and the visual stimulus should not exceed 15 to 20 deg of arc. The slides of the routes were presented by a rear-view projection on a screen mounted 38 in. from the observer's eye. Each slide was exposed 8 sec.

Priority of Urban Problems

In order to place the problem of roadside aesthetics within some kind of context, the observers were asked to rank the following 13 urban problem areas in terms of the urgency and priority of solution they thought was required: litter, air pollution, traffic congestion, junkyards, billboards, noise, overpopulation, poor design, lack of planning, destruction of nature, dilapidated buildings, overhead wires, and dust and dirt.

Procedure

Each observer was initially briefed on the nature of the test and the functioning of the eye-movement camera. After being acclimated to the camera the observer was given instructions to take the point of view of a passenger in an automobile riding down the route that was to be shown to him in the slides. He was asked to pay close attention to the characteristics of the roadside and informed that questions about the roadside would be asked of him later and that he would be asked to evaluate the roadside in terms of some adjectives. After these preliminary instructions were given, the set of 10 slides of the route as it is were shown. After viewing these slides, the observer was asked to rate the route by the 64 adjective pairs comprising the semantic differential.

After completing this task the observer was again seated in front of the screen and instructed that he was going to be shown another set of slides of the same roadside taken in the same place as before. He was told that some changes had been made but that we were not particularly concerned with whether he could detect what specific changes had been introduced. Rather, our concern was whether, in the observer's opinion, the slides he was about to see were in overall character similar to or different from the first series of slides he had seen. If the observer noted a difference he was asked to indicate what seemed to make the difference. This generally took the form of identifying those elements that had been removed. The observer was then asked if, in his opinion, the difference was sufficiently large to warrant a change in his adjective rating of the route. If so, he was asked to change his adjective ratings. The observer was allowed to change his adjectives only if he correctly indicated what it was about the slides that made them appear different from the first ones he saw.

Each observer was shown the 5 sets of slides—the route as it is and all 4 transformations of the route. The order of viewing of the transformations was altered so that slides of each transformation had an equal opportunity of appearing after the slides of the route as it is.

At the completion of this portion of the study, each observer was asked to fill out the attitude questionnaire and the priority of urban problems questionnaire.

RESULTS

Observer Characteristics

The observers were generally representative of a middle to upper-middle class group (Tables 1, 2, and 3). The family incomes of students are generally higher than those of the nonstudent working group. The largest group of nonstudent observers had individual annual incomes that ranged from \$7,500 to \$10,000. The median family income for the United States in 1964 was approximately \$6,569. The majority of the observers in both the student and nonstudent groups had completed between 12 and 15 years of education; the United States average is 10.6 years.

Perception of Changes in the Simulated Environment

Table 4 gives the percentage of observers who were able to detect differences in the simulated environments with the various transformations. As might be expected, the relationship is an increasing function of the number of elements removed from the photographs by retouching. A consistent finding for both routes is that the elements least noticed when removed were the billboards. When utility poles, overhead wires, and billboards were removed, the clue most often used to detect a difference was the absence of utility poles and overhead wires.

Analysis of the Bipolar Adjectives

In order to increase the interpretability of the 64 adjectives comprising the semantic differential scale, we intercorrelated the adjective ratings to yield a 64 by 64 matrix of correlation coefficients. These correlations were in turn factor analyzed by the principal axis method and rotated to a Varimax criterion (7). A total of 8 factors were extracted, but only the first three accounted for the majority of the reliable variance. Although the analysis was conducted for the commercial and landscaped routes separately, only the results for the combined routes are reported here. A more detailed analysis is given in another paper (8).

Factor 1 was tentatively designated a monotony-depression scale insofar as it measures response to the urban roadside. The adjectives that appear on this scale include

TABLE 4
PERCENTAGE OF OBSERVERS WHO NOTICED
A DIFFERENCE IN THE CHARACTER OF THE ROUTE
OR REEVALUATED THE TRANSFORMED ROUTE

Route	Transformation	Percent Who Noticed a Difference	Percent Who Noticed the Wrong Difference	Percent Who Reevaluated
Commercial ^a	1	32.4	13.5	8.1
	2	59.5	8.1	16.2
	3	64.9	10.9	2.7
	4	83.8	8.1	40.5
Landscaped ^b	1	37.2	2.3	11.6
	2	53.5	16.3	11.6
	3	67.4	4.7	34.9
	4	83.7	7.0	23.3

^a37 observers.

^b43 observers.

unimaginative-imaginative, dull-fascinating, monotonous-varied, depressing-stimulating, tiresome-refreshing, usual-unusual, deadly-lively, weak-powerful, and impersonal-personal. On the basis of the direction of the ratings, observers clearly considered the routes to be generally dull and depressing.

Factor 2 was closely related to a description of the compositional and planning characteristics of the routes being viewed. This scale may be referred to as a simplicity-complexity scale. The most representative adjectives were simple-complex, consistent-inconsistent, balanced-unbalanced, symmetrical-asymmetrical, orderly-disorderly, neat-sloppy, uncluttered-cluttered, and organized-disorganized. To give a single characterization to this factor would be impossible because the observers tended to rate the commercial route as complex and the landscaped route as simple. Thus, the overall rating depends somewhat on the ratings given to the separate routes.

Factor 3 is clearly related to the degree of utility and usefulness that the route is seen to have. This scale was tentatively designated as a useless-effective scale. There are high factor loadings for adjective pairs such as useless-effective, useless-useful, unnecessary-necessary, unimportant-important, and ineffective-effective. The observers felt that both the landscaped and the commercial routes were necessary and slightly useful.

Changes in Evaluation When Objects Were Removed

Table 5 gives changes in the bipolar adjectives scales as a function of the transformation of the 2 routes when roadside objects were removed. The changes in evaluation were most pronounced for transformation 2 (removal of utility poles and overhead wires) on the commercial route and for transformation 3 (removal of utility poles, overhead wires, and billboards) and transformation 4 (removal of utility poles, overhead wires, billboards, and on-premises signs) on the landscaped route.

When utility poles and overhead wires were removed from the commercial route, there was a substantial shift in the evaluation of the route to more personal and varied (but still monotonous), much simpler, and much more effective. After transformations 2 and 3 on the landscaped route, observers evaluated it as being much more personal and varied (but still monotonous), much more complex, and much more effective.

A single individual chose to reevaluate the commercial route when utility poles, overhead wires, and billboards had been removed, but he did not respond as might have been expected (Table 5). Rather than approving of the removal of the roadside objects, he objected strongly, believing that the urban roadside should be junky and cluttered. His ratings reflected this attitude. Needless to say, the remaining observers did not share his feeling.

The second inconsistency to be noted in Table 5 occurs for the 5 observers of the landscaped route who reevaluated after transformation 2 when utility poles and overhead wires were removed. Our expectations were that they would respond positively

TABLE 5
CHANGES IN BIPOLAR FACTOR SCORES BETWEEN
THE ORIGINAL AND TRANSFORMED ROUTES

Route	Observers	Transformation	Change in Factor Score		
			Factor 1	Factor 2	Factor 3
Commercial	2	1	-6.97	14.86	-2.93
	6	2	-33.55	26.72	-23.10
	1	3	18.28	0.49	11.83
	13	4	-0.78	7.09	1.90
Landscaped	5	1	-3.12	1.94	0.66
	5	2	6.98	-16.91	10.84
	15	3	-31.89	25.59	-19.79
	10	4	-21.24	27.34	-17.90

to this step. Based on subsequent interviews, it was clear that they did. But when they rated the route on the adjectives, they were responding to the presence of the billboards that were now quite visible rather than to the absence of the utility poles and overhead wires.

Another of the surprising findings was the change in evaluation made by the 13 observers for transformation 4 when billboards, utility poles, overhead wires, and on-premises signs were removed from the commercial route. The ratings did not shift much from those given to the route with nothing removed. The same tendency was noted for the landscaped route but in a less extreme form. The interview material contained a partial answer for this finding. The reevaluators of the commercial route with 3 sets of objects removed were surprised at the dull and uninteresting quality of the resulting environment. Some expressed surprise that the resulting environment would look so appalling.

Analysis of the Attitude Questionnaire

The 97-item attitude questionnaire was also subjected to factor analysis. Three factors were extracted for the entire observer group and accounted for the majority of the reliable variance in the system.

Factor 1 can best be characterized as a set of items indicating extreme negativism to the urban roadside and man's involvement in it. The following items are representative of this factor, and they are all answered in the positive direction:

Highways are reflection of "buy-buy-buy" economy.

Most of the man-made objects found along the roadside are an eyesore.

The urban roadside can be characterized as a reflection of garish bad taste.

Large sections of the urban environment are generally dull and depressing.

Factor 2 is organized around a belief in conservation, preservation, and the maintenance of order. There is an apparent longing for a return to the simpler and less complicated aspects of life experience. It is felt that preservation and conservation should be fostered at any cost. The negative attitudes expressed about urban areas are caused, in part, by the city's diversity and complexity, with a resultant difficulty in comprehending the urban environment. Representative items include the following (all are answered in the positive direction):

The designer's major responsibility should be the reduction of ambiguity and random arrangements.

Buildings reflective of past elegance and refinement should be preserved at all cost.

The diversity of the city is too demanding.

Cities are a necessary evil.

Factor 3 is characterized by a set of attitudes that indicate a desire for an action-oriented environment. The contemporary environment is seen to be more important as a source of visual stimulation than the traditionally defined art found in exhibition halls or museums. Thus, the roadside is seen as exciting and, even though the man-made artifacts along the roadside are considered a mess, their existence is believed to be necessary. The feeling is also expressed that billboards should be preserved as a part of the roadside scene. Urban living is considered essential, and there is a lack of desire to participate in nature-oriented activities. The following are representative items and are answered in the positive direction:

In the abstract rural life may be desirable, but in reality it is exceedingly dull.

Action is more important than contemplation.

The roadside is a reflection of a vitality that is typically American.

The visual environment should be exciting and action-oriented.

Relationships Between Semantic Differential Scale and the Attitude Questionnaire

A number of variations occurred in response to the roadside environment based on the adjective scales. In an effort to account for these variations, scores on the 3 factors of the semantic differential scale were correlated with scores derived from the attitude questionnaire. The results indicated that the factors representative of attitudes toward the roadside were reasonably good predictors of the direction of the adjective scales.

Those who scored high on the negativism to the roadside factor were more likely to consider the roadside as monotonous and useless, and those who were looking for an action-oriented and visually exciting roadside were less inclined to do so. Even so, both groups were generally negative to the roadsides represented in the slides but for different reasons. A more extensive analysis of these findings is contained in another paper (9).

Priority of Urban Problems

Although evaluations and attitudes toward the visual character of the urban roadside were the primary interest of the present study, issues relating to priorities that observers place on a whole spectrum of urban environmental problems were also considered. The observers were asked to rank 13 problems in terms of priority of solution. Although variations occurred, a Kendall Coefficient of Concordance (10) indicated that basically the observers were in agreement. Air pollution, traffic congestion, and lack of planning were relatively high priority problems; noise, dust and dirt, and billboards received relatively low priority rankings.

Analysis of the Eye Fixations

The analysis of the eye-movement films involved a categorization of the various elements on the roadside on which the observer's eye could conceivably become fixated. Percentages were calculated for each of the categories, and an effort was made to determine how patterns of eye movements changed as a function of the removal of roadside objects.

The total number of eye fixations is negatively correlated with fixations on utility poles (-0.512) and is positively correlated with fixations on the road (0.612). This suggests that as the observer looks at utility poles he is likely to look at the road and to show a tendency to focus on environmental detail rather than scan the roadside. This implies that the utility poles have a tunneling or perspective effect on the observer's pattern of viewing the slides. This result was borne out by observing the changes in fixation points as the utility poles were removed from the slides. For both the commercial and landscaped routes, attention was redeployed away from the road to the adjacent areas. Looking at billboards, on the other hand, is positively correlated with fixations on other signs (0.314) and total fixations (0.531). This finding should not be taken to imply that the presence of billboards produced a deployment of attention away from the road even though the correlation between looking at billboards and the road was negative (-0.360). This result simply suggests that, as the slides are scanned, the likelihood is that fixations will be on billboards as well as on a number of other roadside elements. Which roadside elements account for scanning is not known at the moment.

RESEARCH IMPLICATIONS

The findings of the present research point to the importance of being able to secure a degree of experimental control over the elements that comprise a complicated visual environment. The data clearly indicate that observer response to selective changes in the roadside environment is neither random nor unpredictable. Throughout the course of the investigation observers were able to assess the effects of selected changes in the roadside, and their responses were occasionally surprising both to the investigators and to the respondents—for example, the response that the commercial route was dull when all signs, overhead wires, and utility poles were removed.

The importance of the context is also clearly demonstrated. Although the landscaped route did not even represent a close approximation to the art of the landscape architect, the observers felt that the presence of various man-made elements had a rather negative effect on aesthetics. On the commercial route the design features that remained after selected objects were removed were sufficiently dull to cause the observers to consider the total roadside monotonous and ineffective. This finding again underscores the necessity to consider the entire roadside configuration when the outcomes of specific interventions are predicted.

The apparent existence of 2 distinctly different groupings of attitudes toward roadside aesthetics highlights one of the problems of research on consumer preference. This research has not been able to deal with the question of how or whether these orientations should be balanced off against each other. When the research was initiated, no clues existed to suggest that these attitudinal differences would be found. As a consequence, no provisions were made to investigate these differences in detail. This must await further research. At the moment it would appear that these differing conceptions of the functions of roadside design are diametrically opposed to each other. Still, both groups of respondents were in agreement regarding the basic monotony of both the roadsides. It would be quite interesting to know whether both groups would agree on roadside developments that were considered to be aesthetically pleasant. At the moment, the safest prediction would be that those who wished the roadside to be action-oriented and visually exciting would be easier to please than those who expressed strongly negative attitudes toward the roadsides represented in the slides.

Another limitation of the present research is its concentration on roadside aesthetics. The "complete highway" concept involves considerably more than aesthetics; highway safety must clearly be dealt with as well as aesthetic enjoyment. Possibly the most telling example of the potential conflict between these 2 issues is related to the finding concerning the removal of overhead wires and utility poles. The removal of these objects had the most positive effect on judgments of aesthetic preference. Yet, the eye-fixation data strongly suggests that their removal may produce a deployment of attention away from the road itself to the roadside and the sky. Because the observers in this study were asked to simulate automobile passengers, it would be premature to suggest that the removal of utility poles and overhead wires would have a similar effect on the patterns of eye fixation for drivers. But a nagging question remains, and it would be extremely interesting to replicate portions of the present experiment under simulated driving conditions.

Of course, the present study represents only a beginning in the development of techniques that will allow transportation planners to approach their problems with a greater degree of sensitivity. Further efforts, it is hoped, will allow decision-makers a greater degree of flexibility in understanding the effects that various proposals will have on the variety of behaviors that characterize the traveling public.

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